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The Cause And Control ... Of Melanose

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Melanose is the most common and serious disease with which citrus growers of Florida have to contend. It attacks all species and varieties of *Citrus* grown commercially, but grapefruit appears more susceptible than oranges. Since the development of this disease is directly related to the occurrence of dead wood in the trees, it ordinarily increases progressively with the age of the trees. Melanose is of the greatest economic importance on the fruit, where it causes an unsightly russetting which lowers the grade of otherwise good fruit. The fungus which causes melanose also causes the majority of the stem-end rot of citrus fruit. Its control is the most important factor in the much-needed increase in the percentage of high quality, bright fruit, and is likewise important in the reduction of decay.

Cause

Melanose, as well as the most important type of stem-end rot of citrus fruit, is caused by the fungus, *Phomopsis citri*, the rarely developed perfect stage of which has been named *Diaporthe citri*. This fungus is invariably present on citrus trees with any dead wood and when trees lose vigor or become weakened in any way it readily infects the weakened wood. In Florida, drought, inadequate fertilization (including nutrient deficiencies), scale-insects and cold injury, in the order named, are

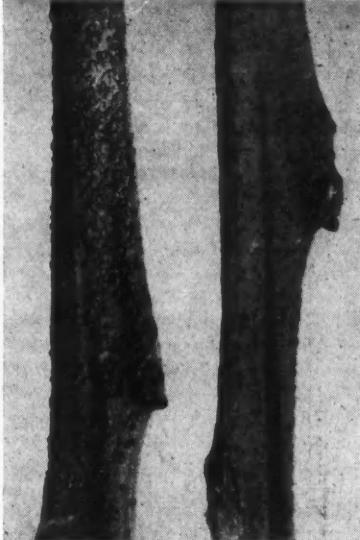


Fig. 3. — Melanose lesions on orange twigs. (Enlarged).

the chief factors in the production of dead or weakened wood. The *Phomopsis* fungus produces myriads of spores from minute pustules developed in the bark of recently dead twigs and branches but is not known to fruit in the corky specks developing from infections on leaves, fruit and living twigs. During rainy or other periods of favorable moisture conditions the spores exude from the pustules in

gelatinous, cream-colored filaments or masses and are carried by water to susceptible parts of the trees, there producing infection. The perfect stage of the fungus has been found to be produced only on dead twigs lying on moist ground and these spores appear relatively unimportant in the production of melanose under grove conditions. Therefore, it does not appear essential from the standpoint of melanose control to remove prunings from the grove. Outbreaks of melanose depend on three principal factors: (1) favorable temperature and moisture conditions for the dissemination of the spores and the occurrence of infection, (2) susceptibility of the fruit, foliage and twigs as determined by their stage of growth, and (3) supply of spores during this period of susceptibility as determined by the amount and age of the dead wood and previous rainfall.

In order for the *Phomopsis* spores to produce melanose infection on the fruits, leaves and twigs they must be washed to these parts and encounter conditions favorable for germination while these tissues are sufficiently young to be susceptible to infection. Moisture in the form of rain, heavy dews or fogs, is necessary for both. Cloudy, rainy periods of two or three days, however, provide the most favorable conditions

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The Position of The Grower

Of Small Acreage In The Citrus Industry

You know, folks, I think Col. Floyd must have feared he was putting his neck out where he might lose it when he phrased this subject. Out in the country where I live we refer to the man he is calling the grower of small acreage, a small grower, without thinking of him for a moment as small, either in stature or intellect. And we refer to the man who produces a large volume as a large grower even if, as compared to the small grower, his stature and intellect are in inverse ratio to his acreage. For the sake of brevity I shall so refer to him, since I intend to mention him several times in this paper.

When our genial secretary wrote asking me to handle this subject I was reluctant to do so because I belong to that class of growers who are neither large nor small and who suffer all the griefs of both but are not accepted by either. I delayed my reply so long however that he wouldn't take no for an answer. So I shall stick my neck out and attempt to sketch for you my impressions of the place the small grower has in the Florida citrus industry. You may differ with me but that is all right with me.

In 1884 when I came to Polk County as a small boy the total volume of citrus fruit produced in the state was only about one million boxes, practically all produced by small growers. From the beginning the small grower has been a vital factor in the industry. His was the credit for nourishing his trees back into production after the severe freezes of 1886 and 1894-95. The quality of the seedling oranges produced during that period by the small grower established the reputation of Florida oranges in the markets of the world.

Throughout the development of the industry the small grower has as a rule worked his own grove so long as its size was such as to permit the owner and his family to do this, and in many cases he made up for a scarcity of fertilizer by working the grove a little more. Those who have done their own grove work have saved the money spent by the large grower who could not do all of his work even if he wanted to. In con-

trast the large grower has had to pay out cash for his grove work and in cases where he has not owned his own equipment and operated it with hired labor he has had to pay a profit to the caretaker doing his work. Of course in some cases the small grower has had to do likewise but not generally.

The small grower has had to buy his fertilizer and spray material in small quantities at higher costs and on less advantageous terms than has the large grower who buys in wholesale quantities and gets rock-bottom prices. This does not apply to the small grower who is a member of a co-operative caretaking organization that is efficiently operated for the benefit of its members rather than for the benefit of its employees. In that case the small grower enjoys the same advantages in buying fertilizer and spray materials as the other members of the co-operative, and if grove cultivation is done by the co-operative instead of by the owner he benefits by the lower costs of large volume operation.

In the matter of marketing the small grower is frequently at a decided disadvantage. The cash buyer will usually pay more per box for a large crop than for a small one. There are several sound reasons for this. The costs of packing and hauling are lower for picking one large crop where a crew works steadily and no time is lost in moving, than picking several small crops aggregating a similar volume where several moves have to be made and time is lost.

Then a single large crop is likely to grade more evenly as to quality and size than several crops where the cultural, fertilizer and spray programs may have differed greatly. This permits the shipper to maintain his grades better than is possible where the fruit is obtained from numerous small growers. We all know of cases where the failure of a car to measure up to the grade standard of a previous car of the same brand has resulted in rejection and loss of business. Even if the shipper don't pay more for the large crop he is likely to favor the large grower in buying his required volume and the small grower is penalized

BY E. L. WIRT
AT MEETING OF FLORIDA STATE
HORTICULTURAL SOCIETY

ed and likely will lower his price in an effort to effect a sale. This gives opportunity for the buyer, and particularly the truck buyer, to play one small grower against another until he has chiseled the price down to the point where there is no profit for either.

Distance from a main thoroughfare is an additional handicap to a small grower, and many small groves are so situated.

In years when the volume of the crop is large the buyer is conspicuous by his absence and the small grower who has no packing house connections is at an additional disadvantage. This has resulted in an increasing demand from the small grower that he be permitted to move his fruit into interstate commerce without moving it through packing houses where he insists the charges are out of proportion to the services rendered. The Sheldon Bill was sponsored in the last legislature by growers seeking to provide outlets for their crops when no shipper buyers were available and where they felt the packing house charges were too high. Many small growers are suspicious of all regulation because they have in the past had no part in the formation of laws and regulations which have been enacted and placed in effect at the instigation of the shippers as a rule and have appeared to the small growers to have benefitted the shipper rather than the grower. They either gave no consideration to the need for reasonable regulations for the protection of the Florida citrus industry or were willing to tear down the whole structure for the sake of wrecking those on whom they placed the blame for their situation. This group overlooked the fact that most of these laws and regulations were the direct result of abuses that were being practiced, and even though so framed in some cases as to favor certain interests, yet had accomplished some definite good.

As a compromise the legislature passed the so called "Wash Shed Act," designed to permit the small grower to have his fruit washed, graded, inspected and put into legal containers so that it could comply with the laws and move into inter-

state commerce at a minimum cost. Without any attempt to argue the merits and demerits of this Act, and it has both, I want to call your attention to the resentment of many small growers at the action of those shippers, both independent and co-operative, who instigated the court fight that prevented the small grower finding out for himself whether this Act would accomplish the purpose for which it was intended. The small volume of fruit that would have moved through the limited number of wash sheds that were contemplated could not possibly have affected the shippers' volume to any great extent, and I imagine that the savings accruing to the growers would have been so small that they would not have been interested in continuing their operation on any extensive scale. On the other hand the fights made by the shippers convinced a large number of small growers that the shippers did have something to hide from the grower, and I see signs already that some of these small growers will renew their efforts to have all restrictive regulations repealed at the first opportunity. Of course I am convinced that this would make matters much worse, but many small growers reply that they will take their chances and that if they are ruined those who are responsible for this situation will be in the same fix and then everybody will get a fresh start. I think you will agree with me that this attitude indicates a dangerous situation. The thought at once occurs that a majority of the small growers are not so short sighted, but the fact remains that but for the compromise Wash Shed Bill the Sheldon Bill would very likely have been enacted into law, and the removal of all regulations in Florida would doubtless have resulted in all sorts of regulations and restrictions being put into effect in some of the states and in many of the large cities into which Florida fruit moves freely under existing regulations. In my opinion it would have been much easier to see that reasonable and necessary regulations were enforced in the wash sheds under supervision of the Inspection Department than it will be to defeat a repeated effort to repeal present regulations if the small grower is not given greater consideration by the existing marketing agencies, or other means provided to insure him an equitable market.

The objective of most shippers, both independent and co-operative, is to increase their tonnage unless they have already reached the ca-

pacity of their plant, and in attaining this objective most of them seek out the large growers, and the small growers have to fight for an outlet for their crops. I know there are many exceptions to the picture I have drawn here, but in the main these are the facts that the shippers and large growers should consider.

In our Grower organization there is a growing demand that some solution be found. The help of the shippers was sought in working out a practical plan, in fact the shippers were first requested to present a plan to which they would subscribe, and no two of them could agree on anything.

Our organization is now working with several progressive growers—shippers, independent co-operatives and the Florida Citrus Exchange in an effort to formulate a plan that will co-ordinate the sales effort of all these groups and give control over a substantial part of the tonnage of the state to one sales organization. This in my opinion will go far in solving the problems of both the small and the large grower.

Co-operative organization will permit a small grower to receive the same consideration and protection in times of emergency as will the large grower.

When conditions require that a greater volume of fruit be moved than the capacity of packing houses permit, or when market conditions are favorable and everybody wants their fruit moved to take advantage of such conditions, co-operative organizations alone will provide and insure equity in such movement.

The small grower is important to every community in the citrus area of Florida. A larger percentage of his money is spent locally than that of the large grower. He is more numerous and the group requirements for food and clothing and everyday living needs are greater. His prosperity affects more directly the local community. On the other hand if his grove brings him a loss year after year he must eventually become a burden on his community. Every resident of the community has a direct interest in every effort that is being made to better the grower's position, and should aid to his utmost every sound effort to accomplish this.

Before this plan has been put into its final shape those who fear it may cramp their style have started to fight the plan. Our committee holds no brief for any existing organization, neither does it plan to tear down, but if any organization is

selfishly disregarding the growers' interests in its operation it can scarcely expect the grower organization to help perpetuate its existence. We hope for the co-operation of every constructive shipper and grower whose interests are similar.

The record of the Growers' organization in securing the enactment of some constructive legislation last year certainly demonstrates its desire to build up and not tear down. The Maturity law providing higher standards or maturity, the Frozen Fruit law which prevented a repetition of the marketing disaster of 1935, the Standard Field Crate law—all are constructive and though some changes may have to be made to effect desired results, none may say they are destructive of legitimate interests of any one or are designed to do aught but protect the grower in whose interests they were designed. The small grower had a substantial part in this legislation, for the first time. He wants fair treatment and if necessary he will fight for it.

I think I will close by quoting a part of an editorial that appeared in a recent issue of *The Citrus Grower*:

"Growers working individually, without regulations, with each grower competing with his neighbor and cutting prices to get the trucker to his individual grove will never solve the problem of the small grower any more than it has solved the problem for unorganized producers in every section of the country. When the little grower as well as the big grower understands that under the competitive system truckers, f. o. b. buyers, and auction markets are going to buy the grower's fruit at the lowest possible price, and that the grower's only hope for improvement is in collective planting, collective handling, and collective bargaining—when the so called small grower organizes himself with his neighbor and fellow small growers to do a real merchandising job with his fruit, instead of wasting his time in useless effort to tear the industry wide open for uncontrolled competition, then we will be well on our way to solving our own problem and building a secure position for ourselves."

And I may add that the large grower and the grower-shipper must join in such an organization to insure its success and avoid a situation that can be much worse than the present one.

Many Union county farmers are going to plant Crotalaria and Alyce Clover this season, according to County Agent L. T. Dyer.

The Citrus Industry

with which is merged The Citrus Leaf
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LESS FRUIT, BETTER PRICE

According to a report recently issued by the Florida Citrus Commission covering auction sales up to and including May 18, Florida citrus growers have received \$4,500,000 more on the tree for their fruit than during the same period last season, although they have shipped 9,602,400 boxes less this season than at the same time a year ago.

On fruit shipped to the fresh fruit markets, orange growers received \$1,750,000 more than they did last season. Grapefruit growers have received \$1,250,000 more than a year ago and tangerine growers \$1,500,000 more than at this time last season. These figures represent the increased price to growers on the tree.

According to the report of the Citrus Commission, the excellent prices received since the January freeze are making this season one of the most successful in years. Oranges have brought an average price of \$2.30 per box as compared with \$2.01 up to the same date last year, an increase of 29 cents per box. Grapefruit has done even better, this year's average being \$2.14 per box as compared with \$1.72 a year ago, up 42 cents per box. Tangerines, for the first time in years, have proved highly profitable, returning the growers \$1,500,000 on the trees, as compared with a slight deficit last season.

Because of the much greater quantity of fruit shipped last season, the gross return this year has been less than a year ago, but the on-tree return to the grower has been much higher. Up to May 18 last season, 36,856,400 boxes of Florida citrus fruits had been shipped, for which the gross return was \$71,000,000. Up to the same date this year 27,252,000 boxes had been shipped, for which the return was \$62,600,000, a difference in gross return of \$8,500,000 in favor of last year. However, the on-tree-per-box return to the grower is \$4,500,000 greater this year — which is the item which the grower is principally concerned.

In estimating the on-tree return, according to the statement of the Florida Citrus Commission, best available figures are utilized to represent the cost of picking, packing, hauling, transportation, sales charges, etc., and subtracted from the auction average. The Commission report points out that while all fruit did not go to auction markets f. o. b. sales are

usually made at slightly higher prices than the auction would have returned.

While the Commission report does not so state, the conclusion is obvious that without the strict enforcement of regulatory laws covering the movement of fruit following the January freeze, no such favorable prices could have been obtained. Florida's citrus laws of standardization and distribution have been the salvation of the industry this season. The laws as they stand may not be perfect, but they are a vast improvement over unregulated shipments. No better evidence of this is needed than the record of prices received under conditions which, with unregulated shipments, would have meant chaos.

HOLLAND

As this issue of The Citrus Industry goes to press, the voters of Florida are choosing their next Governor.

During the recent political campaign in Florida, The Citrus Industry departed from its usual custom, taking an active part in the campaign, believing that the interests of Florida citrus growers not only justified but demanded such action.

The Citrus Industry warmly supported and confidently predicted the election of Spessard L. Holland as Governor of the state.

As the voters of Florida go to the polls in the second primary today, The Citrus Industry sees no reason for changing its prediction.

But, whatever the result of the election today, The Citrus Industry is confident that the citrus growers of Florida will continue to command the interest and the influence of Spessard Holland.

WHY?

In making its report of prices received for Florida citrus fruits this season, the Florida Citrus Commission says:

"F. O. B. sales are usually made at a slightly higher price than the auctions would have returned."

If this is true, why the auction markets?

Why not place all citrus sales on an F. O. B. basis?

More and more citrus growers are asking themselves this question. Even a "slightly higher price" would be welcomed by most growers.

Last week's prices on citrus fruits in Northern auction markets ruled irregular with a slightly downward tendency. However, prices of Florida fruits continued higher than fruit from competing territory in practically all markets. Confidence in the quality of Florida citrus fruits, resulting from strict enforcement of regulatory measures accounts for this satisfactory price differential in favor of Florida.

Eternal vigilance, accompanied by a liberal amount of elbow grease, is the price of quality fruit — and quality fruit spells the difference between a deficit and a favorable balance in your bank account.

THE CAUSE AND CONTROL OF MELANOSE

(Continued from page 5)

for infection. Severe outbreaks of melanose can be definitely traced to such rainy periods, occurring as a rule in May or early June, before the young fruit, foliage and twigs have developed beyond the susceptible stage. By reason of the fact that April usually is a dry month it is only in exceptional years that the combination of conditions is right for heavy infection of fruit to occur this early in the year.

Citrus foliage and shoots are very susceptible to infection from the time they emerge from the bud until they become distinctly hardened. This usually requires about two or three weeks. The fruits are very susceptible at first but become progressively resistant with increasing age. The approximate age at which they

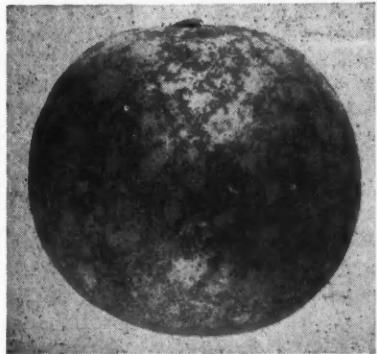


Fig. 4. — Rough, sandpaper-like rusting of grapefruit resulting from severe melanose infection.

attain practical immunity from melanose, based on diameter measurements, varies from an inch for tangerines, $1\frac{1}{2}$ inches for oranges, and 3 inches for grapefruit.

Control

While it is ordinarily possible to effect a fair degree of control of melanose by removing all dead wood, including small twigs and fruit spurs, this is not practicable in commercial groves, especially when the trees are large. Pruning has not proved as effective as a single spray application properly timed. Therefore, spraying usually is relied upon as the principal means of control. However, while spraying alone will control melanose quite effectively ordinarily, in cases where large amounts of recently dead wood are present, especially in trees severely injured by cold, spraying, without previous removal of this dead wood, has not proved partic-

THE CITRUS INDUSTRY

ularly effective. While either pruning or spraying produces fairly good results under ordinary conditions, careful experimental work over a period of several years has demonstrated that combined pruning and spraying will give a much higher control of melanose, both from the standpoint of the trees and the production of bright fruit. However, in past years

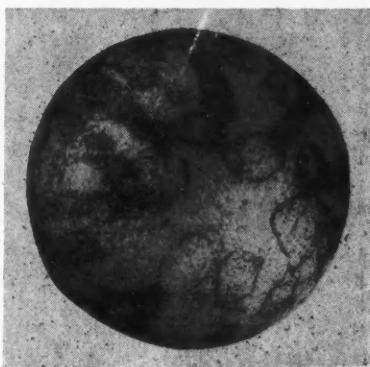


Fig. 5. — Melanose infection on bottom of orange, showing tear-stain, mud-cake and loop effects resulting from spores carried down fruit in drops of water.

far too much emphasis has been laid on the periodic removal of dead wood as it was produced, and not enough on its prevention by proper fertilization, timely irrigation and scale control. Recent observations show that a large part of the dead wood produced each year results from nutrient deficiencies, much of which previously was regarded as "crop strain".

Since the copper fungicides most effective in combatting melanose unfortunately tend to favor an increase of scale-insects, whiteflies and rust mites, melanose control can not be divorced from insect control. The control of melanose is further complicated by considerable variation in the growth and blooming of citrus trees as determined by weather and other conditions from year to year. When weather conditions are such as to keep the trees growing during winter and early spring, their blooming may be spread over a period as long as two months, and sometimes there may be as many as three distinct sets of fruit in the spring bloom. On the other hand, if the trees have been severely affected by drought they may not bloom until May or June. As a result of these conditions, melanose offers one of the most difficult problems in plant disease control.

JACKSONVILLE, FLORIDA

Nine

For the control of melanose by spraying, use Bordeaux (3-3-100) or its fungicidal equivalent in other effective copper sprays, adding wettable sulphur at the rate of 5 to 10 pounds per 100 gallons for the control of rust mites and to check scale crawlers and six-spotted mites. This should be applied about 2 to 3 weeks after the bloom has shed or preferably between April 15 and May 5 in ordinary years, it being highly important that this preventive spray be on the fruit before the May rains start. Under conditions in which melanose has been severe in previous years, particularly when blooming is unusually prolonged or in wet springs, it may be desirable to repeat the application 4 weeks later.

Basic copper sulphate, copper ammonium silicate and cuprous oxide have given practically as good control of melanose as Bordeaux and, by

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Peaches As A Potential Crop

In South Florida

ROBERT P. THORNTON
AT MEETING OF FLORIDA STATE
HORTICULTURAL SOCIETY

While commercial peach production in South Florida has been attempted intermittently since 1894, there has not been, to my knowledge, any case of appreciable volume considered as successful. Commercial peach production in South Florida has been accepted as a complete failure. The principal reasons ascribed for this failure were the Root Knot Nematode, extremely short life of the trees, generally not more than three or four years, and irregular and sparse bearing. It has been generally conceded that a satisfactory fruit set occurred only on an average of about once in four years.

Pasco County Experimental Planting

In March, 1937, we planted 1400 Jewel peach trees in Pasco county, near Blanton. An additional 1400 were planted in March, 1939. While at least three other varieties, the Angel, Peento, and Waldo, were considered as adapted to South Florida

conditions, we selected the Jewel because it seemed to be the one variety which might offer possibilities. There are no varieties other than those above, according to our knowledge, whose dormancy requirements would permit production in South Florida. The soil upon which this planting was made is a very good grade of sandy loam, underlaid at from a few inches to several feet with a friable red clay subsoil, which we considered to be as near the ideal soil type as could be found in Florida. The principal purpose of this experimental planting was to determine if, in the light of modern information, it were possible to solve the old problems which had caused failure, or to find new means of putting South Florida into an early peach market to which its climatic conditions furnished an opportunity.

Production

At one and one half years of age after planting, the production on the original planting was fifteen bushels.

In the following season, age two and one half years, the production was one hundred thirty five bushels; a late February severe cold killed an estimated seventy-five per cent of the young peaches in this crop, cutting the yield from the estimate of six hundred bushels to the above figure. In the present season, age three and one half years, the estimated production is twelve hundred bushels, with the fruit now well set.

Cultivation

Differences in tree size as great as one hundred per cent have been observed in our experiments with different cultivation programs. In general, it seems to be essential to keep the orchard free of grass and cover crop at least through June of each season, and to use very frequent shallow cultivation during that period. Young trees particularly do not seem to be able to compete successfully with growing cover crops.

Fertilization

Our fertilizing program begins,

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Half of the Annual Rainfall Occurs in These 4 Months

FOR that reason, it is important that the fertilizer applied at this time be resistant to the leaching action of heavy rains. The Florida Agricultural Experiment Station, in recent experiments including several forms of nitrogen, found that

Urea Nitrogen is Resistant to Leaching

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on bearing trees, with a top dresser application in advance of the bloom, followed by a mixed fertilizer, about four-eight-eight mathematical formula, just as soon as the fruit seems to be well set. The latter application is repeated as soon as the fruit is removed in May, this completing the annual applications. Mr. Blackmon has covered in detail our experience with Zinc Sulphate; we have experiments under way covering the other usual secondaries, which show some promise, but which are not now sufficiently complete for report.

Spraying

The only spray applications necessary to date have been for the purpose of Curculio control, although we are expecting other insects and fungus diseases to appear at any time. For Curculio control, we are using a spray mixture containing one pound of Lead Arsenate and one pound of Zinc Sulphate, with the equivalent of commercial Lime Sulphur at one to eight, to fifty gallons of water. The first application of the spray is made when practically all of the petals have fallen, repeated when the calyx or shuck has shed from the peach, and again about three weeks before fruit is to be picked.

Borers

There has been a heavy infestation of borers, beginning almost immediately after planting. These were removed by knives during the first season, and later by treatment with Dichloricide. The introduction of Ethylene Dichloride Emulsion has greatly simplified this problem, and we no longer consider the borer as a major hazard.

Clitocybe Root Rot Fungus

We have found the peach tree to be extremely susceptible to this fungus, and understand that there is no known cure or control. To date, age three and one half years, we have lost one hundred ninety-two trees, and now have one hundred forty-six seriously affected, nearly all of which will die this year. In addition, there are two hundred more known to be slightly affected. The number of trees affected seems to increase rapidly with the age of the planting, and it is impossible to predict just how soon the entire planting will be killed.

Pruning

All of our pruning has been done in the dormant season, usually late December or early January, although there are many advocates of summer pruning on Florida peaches. The trees grow unbelievably fast during the first three years, and pruning

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**THE CAUSE AND CONTROL
OF MELANOSE**

(Continued from page 9)

virtue of leaving less residue since neutralization with lime is unnecessary, less increase of scale-insects develops following their use than with Bordeaux. The danger of scale increase may be further reduced by applying the copper fungicides as a fine fog or mist, directed at the outside of the trees, avoiding drenching the interior portions.

Extra Spraying For Insect Control

Following Melanose Spraying

Experience has shown that following the use of copper fungicides, and especially Bordeaux, scale-insects often increase rapidly during the summer months and may do serious damage by fall unless special measures are taken to check such an infestation. If considerable scale, particularly red scale, develops after the use of copper sprays for the control of melanose or scab it is advisable to make a "follow up" spraying with oil emulsion, using 1 1/4 to 1 1/2 % of actual oil. However, where no red, and but little purple, scale develops, a thorough application of lime-sulphur may suffice, using either 1 to 1 1/2 gallons of liquid lime-sulphur or 3 to 6 pounds dry lime-sulphur per 100 gallons, and adding 5 to 10 pounds wettable sulphur in either case. This "follow up" spraying may be made from May through August, preferably between May 15 and July 15, but timed to coincide with the peak of scale crawler development. When spraying for scale control the trees should be drenched thoroughly, both inside and outside. Oil should not be applied to trees that are wilted or are close to the wilting point. Sulphur should not be applied closer than 3-4 weeks after an oil application, nor should oil be applied closer than this interval following the use of sulphur. Do not add lime-sulphur to copper sprays.

**Secondary Benefits From
Melanose Spraying**

There are two important secondary benefits from spraying with copper fungicides for melanose control. One is the reduction in the amount of stem-end rot developing in the fruit, which may be as high as 50 per cent from a single application resulting in satisfactory control of melanose. The other is that it reduces the severity of exanthema (dieback) which may be developing in trees as a result of copper deficiency, and, in some instances, the tendency for the fruit to "ammoniate" may be eliminated entirely.

THE CITRUS INDUSTRY

**THE PROTECTION OF GROVES
AGAINST COLD BY FIRING**

(Continued from page 4)

possible.

On the morning of last January 29th the temperature in the groves on the top of the hill was 31 degrees at 6:00 o'clock, while on the lower slope it was 19 degrees, and at the bottom of the hill the temperature was 15.5 degrees, or a maximum difference of 15 1/2 degrees. With this knowledge, who would want to plant a grove where the temperature may be fifteen degrees colder than some nearby location? This difference in temperature alone may mean the difference between a profit and a loss on grove operations over a period of several years.

There are a number of things which we have learned in the last seven years among which are the following:

On very cold, windy nights when the temperature may go as low as sixteen degrees for several hours, it is absolutely impossible to save the fruit by firing the groves with wood. Some fruit will freeze on the trees even though a fire may be burning in every check. The wind will carry the heat off too fast. The best we can expect under such conditions is to save part of the bloom wood, and prevent maximum damage to the trees. The small limbs in the top of the trees may be killed, while the lower two-thirds of the tree may be saved. When the wind is as strong as it was one night during the 1934-35 freeze and again on Friday night, January 26th, of this year, we could not raise the temperature in the groves in exposed locations over three or four degrees, while we were able to raise the temperature from 8 to 11 degrees in locations well protected by either natural or artificial windbreaks. On such nights a dense windbreak is a tremendous help in maintaining safe temperatures, especially if it extends on the north, west and south sides of the grove.

June, 1940

The direction of the slope in the grove, however, will have an important bearing on the nature and locations of the windbreaks. I am not sure whether it is desirable under some conditions to have a windbreak on the lower slope of the grove, as there is too great a tendency to retard the movement of the air on nights that are comparatively still, in which case the nearby trees or fruit may suffer frost damage.

The following "don't's" may be helpful to the growers who have not had experience in grove heating with open wood fires:

(1) Don't attempt grove firing without having made careful preparations in advance to have all necessary equipment, materials and labor for doing the job well. This includes an adequate supply of grove thermometers, which have been tested and are accurate, placed in easily accessible locations both inside and outside the groves, at both warm and cold locations; a good supply of good, heavy wood, easily accessible, together with the proper material for starting the fires easily, such as batting dross, a by-product of the turpentine industry, fat pine splinters, rosin chips, or other desirable material; proper flashlights, lanterns, safety lighting torches, axes, and shovels.

By an adequate amount of wood is meant enough to fire for at least four consecutive nights. Not less than 5 cords of wood per acre should be on hand and preferably more.

(2) Don't put sap or poor pine wood in a grove and expect the men to do a good job of firing — it is hard enough to fire satisfactorily with large sticks of "fat" wood.

(3) Don't let the man selling you wood put in small, crooked limbs and knots. In the first place you will not get full value in the amount of wood; next it will be harder to haul and to distribute properly and last, but very important, is that the small wood will burn out so quickly that many fires may get too low or go out entirely before the man doing

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the firing can get back to build them up and thus endanger the fruit.

The most desirable size of wood varies from 110 to 130 sticks of 4-ft. wood per cord, with an average of about 120 sticks. Such wood, if fat, will burn about one hour per stick. If the "fires" are laid with three large sticks per fire or pile, these first three sticks will usually burn about three hours, if properly "punched up," and one additional stick will be required per hour thereafter. Of course, two sticks may have to be added at one time and the man doing the firing should watch the temperatures and fire so as to hold the desired temperature if possible. The idea is to burn the wood most efficiently and economically to secure the desired results. "A" or "V" shaped fires are most desirable with the open end of the pile towards the wind or the point towards the trees to be benefited. If the wood is reversed, it will make a large fire which will burn too quickly and may scorch or singe both foliage and the limbs of the trees.

We prefer having the fires laid in every check, with at least five or six sticks of wood by each pile. It is seldom necessary to light all of the fires in any one night. If there are 60 trees per acre, it will require 1 1/4 cords of wood per acre to "lay" the fires and six sticks at the side of each pile would require three more cords, or a total of 4 1/2 cords per acre for a well stocked grove, with more wood piled nearby for use later.

(4) Don't pile the wood in the groves while there is still litter in them which may catch fire and damage the trees. Disc it in or dispose of it in some manner so it will not be a fire hazard.

(5) Don't fail to select a good

dependable man to read the thermometers and make a record of such readings at hourly or 30-minute intervals during the period before firing.

(6) Don't use all of your experienced men for firing the first night. Have one go to bed that night so he can supervise the work of putting out the fires the next morning, relaying the fires, hauling extra wood, cleaning and refilling lanterns, lighting torches, etc., and getting everything in readiness for the following night. This is extremely important for successful firing.

(7) Don't light the fires too early in the night and don't put them out too early next morning. The first course will mean a loss of wood and the second one might mean the loss or damage of the fruit crop. The time of starting the fires will doubtless be discussed by others or can be brought out later.

(8) Don't think you can do a half-way job of firing which will be profitable. If it cannot be done thoroughly and efficiently, it will pay better dividends not to do any firing at all. You can either make all necessary preparations, check and recheck your plans, plan and replan your procedure, then use your head, work long hours and finally save your fruit and trees, in which case the job will usually be profitable, or you can go to bed, leave the matter in the hands of the Lord and Mother Nature and take your chances of not being hurt too bad, — but for pity sakes! Do not attempt the third alternative, which is to half-way prepare for the job and after working like the deuce for perhaps two nights run out of fuel the third night and lose everything. That is a tragedy that happens all too often and causes the greatest losses in the end.

much more time for application than the dust, will control rust mites and kill crawlers and whiteflies, Mr. Watson points out.

To be able to determine when control measures are necessary against rust mites, the grower should carry a good hand lens that will magnify at least 10 times and not more than 15. With this he should examine fruit in various sections of his grove, and

(Continued on page 17)

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Sulphur Will Control Rust Mites On Fruit, Watson Tells Growers

Sulphur will do the job when it comes to controlling rust mites on citrus, says J. R. Watson, State Experiment Station entomologist.

Whether it is to be used in dust or spray form is the question for the grower to decide when he finds control measures are necessary against this common pest of citrus. Sulphur dust may be applied in about a tenth of the time required to apply spray, but the spray has the good points of not only controlling rust mites but reducing the numbers of

whiteflies and scale insects.

If applied dry, finely ground sulphur should be mixed with a small quantity of hydrated lime to facilitate application. Five to 10 pounds of lime added to 95 pounds of sulphur will make application much easier by duster than if the sulphur were used alone.

An effective spray consists of six or seven quarts of lime-sulphur, 100 gallons of water, and from five to 10 pounds of wettable sulphur. This lime-sulphur spray, while requiring

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Reports of Lyons Field Men . . .

POLK AND HIGHLANDS COUNTIES

J. M. (Jim) Sample

The problem that is causing most concern in this territory is the heavy dropage of the new crop of fruit, especially oranges. It has been known for quite some time that the mid-season and early varieties of oranges would have a lighter crop next season but this was due chiefly to heavier freeze damage to these varieties prior to blooming. However, for the past three weeks the new Valencia crop has fallen in alarming degree. Various methods are being employed in an effort to minimize this dropage but it appears that little is being accomplished. It is our opinion that a combination of factors are involved and that the real cause goes back to the heavy bouquet shock bloom that was too weak to set properly. Growers are keeping a close check on red spider and six spotted mite and are making every effort to keep these insects under control. The summer application of fertilizer is well under way and most growers plan to be through by June 15th.

HILLSBOROUGH & PINELLAS COUNTIES

C. L. (Charlie) Little

Groves throughout this territory are in very good condition, but during the past few weeks have shown very definitely that the feed supply is just about exhausted. Many groves are beginning to show yellow, indicating nitrogen deficiency, and as a result most owners are going forward with their summer application of fertilizer. We are having quite a bit of trouble with six spotted mite on grapefruit all through the territory and everyone is busy with lime-sulphur in an effort to keep them un-

der control. It is getting unusually dry in this territory and all growers that are equipped for irrigation are putting water to their property. It appears now that our crop will be considerably lighter than was at first anticipated. The dropage on oranges has been unusually heavy, and this is true with practically all varieties. We will have a pretty good crop of grapefruit and tangerines.

timate for 1940-41 is being lowered day by day. It has been extremely dry through this territory and this along with several other factors has curtailed the crop to a tonnage estimated not to exceed 40% of normal production. While fertilization is going forward on some properties there are quite a few growers that are delaying their application until it starts raining.

SOUTHWEST FLORIDA

F. W. (Felton) Scott

Growers are now in the process of applying their summer application of fertilizer although some are delaying this operation until we can get a much needed rain or until the groves can be irrigated. As a whole we have a good grapefruit crop in this section and practically every grower is making an effort to produce real quality fruit during the season. There is a great deal of spraying being done at this time in an effort to keep various insects, especially six spotted mite under control. This particular insect is doing lots of damage to grapefruit in the territory. Tomatoes are beginning to move from the Palmetto and Ruskin sections with indications pointing to a very light crop. Prices are good however, and most growers are hoping to have a successful season.

NORTH CENTRAL FLORIDA

G. W. (George) Phillips

Growers throughout this territory are claiming that they have the most serious infestation of six spotted mite and red spider in their experience. Consequently, practically every grower with a spray machine is keeping it busy full time in an effort to keep these pests under control. The crop es-

EAST COAST

Growers in the vegetable growing sections of this territory have had an in and out year. Regardless of how much effort has been put forth we have been unable to beat the weather conditions. All during the season the rains have been the factor that caused the most of the damage. In the bean growing sections this spring conditions have been a little better. While the production has not been normal, the prices have been fair and as a result some growers have been able to show a profit.

WEST CENTRAL FLORIDA

E. A. (Mac) McCartney

Most growers in this section have completed their summer application of fertilizer. The groves are in good condition and from all that I can learn we have equally as good crop in this section as any part of the state. We are going forward with spray program to keep diseases and insects under control and expect to produce quality fruit this season. Most of the vegetable growers have about come to the end of their season and while weather conditions have been adverse, I am glad to report that most of our growers had a satisfactory season and will soon start thinking about their crop to be planted in the fall.

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Suggestions for Grove and Farm Care

FERTILIZATION

If you have not made your summer application of fertilizer to the grove, now is the time to go forward with this operation. The summer application should contain a high percentage of organic nitrogen in a well balanced mixture with high percentage of potash. While many growers are using nutritional sprays to correct mineral deficiencies we want you to remember it is also important to correct the condition causing these deficiencies, and the only way that this can be done is to build up a reserve of these materials in the soil where they will be available to the plant at all times. The best way to get these secondaries in the soil is to put them there along with your regular application of fertilizer. Consult the Lyons Field Man in your territory and he will be glad to make careful inspection of your grove and advise with you regarding the proper materials that should be used and the poundage to include with your fertilizer.

PEST CONTROL

Keep a watchful eye on the grove for various insects and diseases. Reports from all over the state indicate that various insects are very active. If you are not thoroughly familiar with these pests call in the Lyons Field Man and he will be found thoroughly competent to advise with you. Trees have not thoroughly regained their vitality since the shock of the recent freeze and being in a weak condition are particularly susceptible to various diseases and insects. Red spider and six spotted mite are taking a heavy toll of foliage at this time. They should be controlled immediately. This can be done with an oil spray or a lime sulphur application. The material that you use will depend on the practice that you have employed during the past few weeks. In other words you cannot use oil within four or five weeks after having used

sulphur. Here again we suggest that you contact the Lyons man for information regarding proper spray method. We want to urge you to grow quality fruit this season as we believe that quality fruit will pay big dividends on the market this fall and next spring.

CULTIVATION

After making summer application of fertilizer it is important to thoroughly cultivate the grove. This will serve a dual purpose in that it will incorporate the fertilizer with the soil in the vicinity of root zone increasing the efficiency of the fertilizer and at the same time creating a favorable condition in the soil for your summer crop to get started.

COVER CROPS

In last month's Lyonizer we urged you to make plans for establishing a good cover crop in your grove. We again urge you to plant a cover crop such as beggar weed or crotalaria. In some cases where you have a heavier type of soil you can use alyce clover to good advantage. Cover crops will not only protect your soil from the extreme summer heat but will give you some very desirable organic matter that when worked in the soil this fall will revert back to plant food that can be used by the tree. It also will serve as a medium for bacterial development that is so important in obtaining efficiency from plant foods that will be applied in commercial form.

PRUNING

Remove dead wood from your trees. Take out water sprouts. There are a few groves in the state that were badly damaged by the freeze that should not be pruned until after the rainy season starts in this summer. By this time you will be able to determine just how much wood will have to be removed from the tree. We find that on those groves that were badly damaged that wood is continuing to die back.

We have hardly touched Florida as far as agricultural possibilities are concerned. During the past few years several new farming sections have been developed. The property adjoining Lake Istogoga in Highlands county is developing into one of the finest farming sections in the state. It appears that most any winter vegetable crop can be grown there with marked success. Just recently W. L. Waring, Jr., the president of our Company, made a trip to this section with several other leading business men, and he has expressed the opinion that this will eventually develop into one of the real garden spots of Florida. Over on the west coast there is quite a development just south of Naples that promises to be one of the leading winter vegetable production sections. Then in our last issue of THE LYONIZER we stated that Ruskin, also over on the west coast, was fast becoming the center of tomato production. In connection with these newly developed areas the LYONS FERTILIZER COMPANY is proud of the fact that they are playing a part in the progress that is being made. Our Company has made careful studies of the soils from these properties and will continue to keep in close touch with new developments so we will be in better position to advise with the various growers in an effort to obtain maximum production at the lowest possible cost.

It is not our custom to exploit the capabilities of our field force in THE LYONIZER as we feel that these men through their daily contacts in the field will demonstrate their ability as capable, intelligent, thoroughly reliable sources of information. However, we do want you to know that every effort is made to keep these men posted with all of the latest information that is released from Federal and State Experiment Stations, from our own research work and from any other outside work that is really constructive. We consider our Field Force as the latest source of up to the minute information as well as agents for the best fertilizer that it is possible to make.

CANNING...

To Save Freshness

Raw foods are nearly always called "fresh" foods, particularly fruit and vegetables. Yet they are frequently many miles and hours from the garden or truck patch, the orchard or grove. You never know, really, just how long, how many days or weeks have passed since some of our so-called "fresh" foods found on the markets have been gathered, or have been held in cold storage before we make our purchases.

Then what is true freshness?

Freshness, I would say, is not measured in degrees of time, but by the nearness food can be held to its perfection at the moment of harvest. High quality canned foods are harvested and put under seal in all their original garden freshness and flavor before they can take their place on the pantry shelf, or before they start their journey toward the distant market places.

There is an old slogan among home canners that allows "an hour from the field to the can." We know that some vegetables, like English peas and sweet corn in particular, deteriorate rapidly after picking, losing flavor and sweetness. That is why we urge that there be no delay between picking and canning operations. That is why housewives are urged to can only for highest quality — that is, for highest possible flavor and food value: fresh, luscious berries and fruits; fresh, succulent vegetables, beans, peas, corn gathered in their prime and canned, if possible within two hours after gathering unless, of course, they are held in a cold place. Loss of fresh flavor and the growth of many heat resistant bacteria soon characterize products held in a warm kitchen or a warm grocery store.

Many of our commonly canned garden vegetables are naturally excellent sources of vitamins A and C — which are most subject to destruction by oxidation due to exposure or to open-kettle methods of cooking or canning. It has been found that much of this vitamin content is rapidly lost if the vegetables stand in a warm place or if piled up — especially during warm weather — after coming in from the garden. Out of our laboratories have come many new discoveries about foods and about good and poor methods of food

preparation. It has been found that the less the vegetable is exposed to the air, the better for vitamin saving; hence peas and beans, for instance, should not be shelled until just before canning operations, since it has been shown that shelled peas and green lima beans lose ascorbic acid much more rapidly than unshelled ones. The beans keep their vitamins only when left in the pod after picking, losing it rapidly after being shelled. So vitamin-wise housewives, too, buy their peas and green lima beans in the shell, and shell them just before cooking to avoid unnecessary exposure to the air. When freshly gathered and just mature enough, these vegetables — peas, snap beans, butter beans, green limas, and sweet corn — contain sugar as well as vitamins, and as we have intimated before, if these vegetables are held in a warm place after they are picked, the sugar rapidly changes to starch. Up-to-date canning and freezing industries and commercial shippers of fresh vegetables now make every effort to cool vegetables right after harvesting. Sometimes the vegetables are plunged into ice water to take out the "field heat" and are then held in a cold room. Sometimes they are packed in ice before shipping. Housewives may well take a tip from these industries and use their refrigerators to slow up enzyme action as well as to save vitamins, flavor, and crisp texture-or-freshness, to say it in one word, since these valuable and desirable properties are all linked up together.

When freshly gathered, prime products are canned by approved, up-to-date methods, these canned foods will really be ultra fresh and may be distinctly superior in quality to the so-called "fresh" or shipped-in products purchased at the store and cooked in the customary way.

In general, however, your canned products will be as good as you make them — Grade A, Grade B, or only standard or Grade C.

It is important that we continually strive to improve the quality of our canned products. The old saw, "A penny saved is a penny made," has in it a lot of truth and one way to apply it right now is by the way of the garden-orchard canning route.

ISABELLE S. THURSBY
Extension Economist In Food
Conservation

Every dollar of the family living that comes from the farm is just so much added to the farm income, and leaves the actual cash income for other things. Certainly if it is desirable to earn money this summer, canning the surplus from the home garden and orchard to help fill the pantry is one sure way to do it, for thrifty people always plant with the thought of having a surplus to can.

If home canners will center their attention on the family health and will work out a well balanced canning budget that suits their particular needs and that counts for quality, health and efficiency, they will find that canning "in season" will save money, time and energy "out of season".

In addition, these "off season" foods carry with them an atmosphere of luxury the farm family can well afford because they were conserved when the products were in season



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and when in too great an abundance to use at the time.

Right now this season promises to be a big one for many fruits; that is, if we judge by the amount of wonderful bloom that has been over the state this past month. Pear trees have been indescribably beautiful in their snowy-white bloom. The plum-thickets and trees, wild and cultivated, and the peaches are unusually colorful and spectacular and indicate a heavy crop ahead. Mayhaws, that choice juice and jelly making fruit growing in the pastures and low lying wood lots and fields of north and west Florida, are lovely in their bloom, mingled with new foliage. Right now, in several sections of the state the luscious strawberries are cheap and plentiful and just right for canning and preserving. How many of us are eating all that we can of this incomparable berry and are canning and preserving all that we can't? Or do we consider that they are grown for shipping purposes only and thus overlook the most important market of all — the home market.

That's a hint. That's a broad hint that now is the time to plan how you will make the most of these and other valuable fruits. Now is the time to get set with good methods of canning, preserving and for making juice. Then when the height of the season arrives and the fruit is at its best, you will be ready to take advantage of it.

PEACHES AS A POTENTIAL CROP IN SOUTH FLORIDA

(Continued from page 11)

must be heavy. Our own experience indicates a system of pruning entirely different from that accepted in other sections. The Jewel under Florida conditions seems to set practically all of its fruit upon the small wood, and removal of too much small wood will result in loss of the early age crops. As the trees become older, more fruit is set upon the large wood, and pruning may then be gradually changed into the regular system.

Climatic Limitations

Commercial possibilities in this peach seem to be placed in the South Central area of the State, or other areas of like climatic conditions. If planted too far North, sufficiently early maturity will not be obtained, while points too far South do not furnish the amount of winter dormancy required for consistent fruiting. Even in the best locations in the above area, Jewel peach trees are

inclined to bloom intermittently during the warm periods in winter, and particularly to bloom too early in spring if an extended warm period occurs. The young peach, for about two weeks after bloom, is quite sensitive to cold, and may very well be completely killed by such temperatures as we frequently have in February.

Shipping

The Jewel peach has a very thin skin, the meat is unusually tender and delicate, and very easily bruised. It will become overripe and deteriorate rapidly after being picked, and has been generally conceded to be too fragile for shipment to distant markets. About thirty-six hours seems to be the limit for keeping a commercial package in good condition under ordinary handling. Prior to this season, we have marketed in Tampa only, but it will become necessary this year to reach other markets. For this purpose, we have designed a special container to allow maximum ventilation and the least possible bruising of the individual peaches from the weight of the pack. These packages will be put into the Eastern markets in refrigerated trucks, and it is our expectation that the fruit so handled will carry sufficiently well to meet conditions in this early market period.

Conclusions

From the information gained to date, we believe that the Jewel peach in carefully selected locations, has good possibilities and wonderful probabilities as a commercial crop in south Florida. We can see from this information, definite expectations of overcoming all of the previously accepted causes of failure. The Slitocybe Fungus, which we did not anticipate, now seems to be the obstacle against which we can see no remedy. It seems logical to conclude that much of the previous trouble laid to other sources may have been caused by this fungus. We are starting a new planting, and taking up an entirely new plan of experimentation and study, based upon the new facts and conclusions obtained from the original planting. While we know that this new planting will be a distinct improvement, much experimental work and study must be done, and many problems solved, before peach planting in South Florida will become successful, except in lucky instances.

Forest stands in the South are only one-half to one-fourth stocked, according to a report of the United States Department of Agriculture Forest Service.

SULPHUR WILL CONTROL RUST MITES ON FRUIT, WATSON TELLS GROWERS

(Continued from page 13)

begin control measures when he finds that half of the fruits he has examined are infested with the pests.

Injury done to fruit by rust mites early in the Spring is different from that done later on, the rind showing a mottled effect and the thin epidermis is broken into small, crescent-shaped specks; later injury results in even, smooth discoloration.

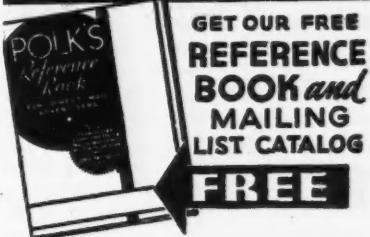
Warm, dry weather is favorable for rust mite development. Each female lays about 500 eggs, and she may begin laying when only a week old. This rapid multiplication accounts for the quick appearance of large numbers of rust mites when weather is favorable. The pests first appear on leaves and twigs, but go to the young fruits when they approach an inch in diameter.

NOW MAKING PLANS FOR SUMMER CAMPING SEASON

Although the summer camping season for 4-H members, which will begin about the middle of June and is expected to draw 3,000 boys and girls before the first of September, is still a few weeks away, plans are being made for it now by the State Agricultural Extension service.

Improvements are under way at the three permanent camps owned by the Extension service. These are Camp McQuarrie in Lake County, Camp Cherry Lake near Madison, and Camp Timpoochee on the Chotawhatchee Bay in Okaloosa county.

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**FIRING 300 ACRE GROVE
AT CITRA DURING THE
JANUARY 1940 FREEZE**

(Continued from page 3)

quires more heaters per acre, hence requiring more labor in lighting and refilling.

We have two large storage tanks with 46,000 gallons capacity, which was none too much, but sufficient for refilling each day during the last cold. In refilling we used 580 gallon tank trailers pulled by tractors equipped with two 30 foot wet end hose, and six smaller tanks on pickup trucks. One tractor will refill 15 to 20 acres in ten hours at one half mile hauling distance.

We have prepared a chart showing the relative cost of fuels per acre as indicated by our experiment. Forty oil heaters per acre, nine hours maximum burning, one gallon per pot hourly, at .05 1/4c per gallon cost \$19.80. Forty open wood fires per acre, nine hour burning, three cords of wood at \$5.00 cost \$15.00. Forty coke heaters per acre, nine hour burning, one and one third tons of coke, plus fat kindling, cost \$13.08 per acre. The cost of labor and handling is to be added to the cost of the fuel. Oil requires less labor than wood or coke, coke being the most expensive to handle. The big advantage of oil is being able to regulate or shut off the heaters when necessary.

In reference to control, we based our outside temperatures on three Government thermometers stationed in this section. Every night was different as to degree of control. Temperatures were easier to hold up on still frosty nights than they were on windy nights. The coldest night with an outside temperature of 18, we held the thermometers at 28 to 30 in one part of the grove, other parts of the grove not so good. It is very hard to say that you may maintain a grove temperature of 28 to 30 or any other certain figure, as one side of a tree closest to a heater may vary three to five degrees from the other side of the same tree. Picking after the freeze best demonstrates this variation in grove temperatures as our fruit in the middles having heaters showed no damage. We picked these middles first, giving the off middles time to show extent of damage.

Our first estimate made immediately after the freeze was 75 to 85 percent sound, but this was altered by circumstances which followed the freeze. One hundred acres of this grove are Pineapple oranges from which about twenty-five percent of

THE CITRUS INDUSTRY

June, 1940

the fruit from the grove had been gathered. The fruit was fully ripe and dropping before the cold. Following the freeze we had several windstorms which made our damage loss heavy, estimated at twenty to twenty-five percent of the crop. We harvested about fifty percent of our estimated crop on the trees at the time of the cold.

To say that firing of citrus fruit in Florida over a period of years will pay or that it will pay on your grove is for you to decide. We do some firing nearly every year, and if we are to use this year as a test period of firing, lets count cost and returns. The returns on the fifty percent of the fruit saved, which would have been a total loss without firing, considerably more than paid the entire expense of firing the one hundred and twenty acres of fruit, also the one hundred and eighty acres which was fired for foliage only, besides leaving the trees in a splendid condition for this year's crop.

Land-use planning is a process of systematically and cooperatively analyzing the problems of the people and of the land.

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CITRUS BUDS AND SEEDLINGS—
Usual Standard Varieties on Sour Orange Stock, also Sour Orange Seedlings. Nursery at Blanton, Pasco County. For information and prices, write R. P. Thornton or H. S. Pollard, Copothorn Nurseries, Box 2880, Tampa, Florida.

ALYCE CLOVER SEED "Florida's Alfalfa" — The perfect cover crop for groves because of its rich nitrogen content and because it quickly disintegrates and is absorbed into the soil. Write for descriptive folder and prices. Ocala Ridge Tung Plantations, 302 So. Natl. Bank Bldg., St. Petersburg.

GRAFTED AVOCADO TREES of leading varieties, priced low. R. B. Rosentreter, Winter Haven, Fla.

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PIPE — Approximately 800 feet 5-inch Ames End Lock, plain surface pipe. Perfect condition. Used once. Also new pipe. Write stating full needs. Cameron & Barkley, Tampa, Fla.

CHOICE Rough Lemon Seedlings 6 to 20 inches high, \$10.00 per thousand. Olan Altman, Sebring, Florida.

CITRUS NURSERY TREES; Standard and new varieties. Low prices for Fall planting. Grand Island Nurseries, Eustis, Fla.

GROWERS ATTENTION—I will exchange old established manufacturing concern doing splendid business for producing orange and grapefruit grove in good section free and clear of encumbrances. Value approximately \$75,000.00. Address A. J. SIMMS, Tampa, Fla.

LARGE AND SMALL orange groves for sale also acreage suited for citrus culture, dairying and general farming. Charlton & Associates, Valuation Engineers and Real Estate Appraisers, Ft. Lauderdale, Fla.

CROTALARIA SPECTABILIS and Hay Peas. Write for our prices. We also have a full and complete line of all farm seeds. Robinson's Seed Warehouse, Cairo, Georgia.

"MAIL ORDER Operator desires contact with grower of high grade avocado pears. Have interesting proposition for grower of highest quality fruit." F. R. Gardner, P. O. Box 528, Greenville, Pa.

PLANT SOAR'S SWEET ORANGE trees for profit, fruit sells in September for \$1.12 1/4 to \$1.50 per box, no losses from drops or frozen fruit, does not dry out on lemon. Pomona Nurseries, Dade City, Fla.

EMPLOYMENT WANTED — World War veteran. Citrus, landscaping and salesman experience. 12 years last employer, college education. References, Box 384, Eustis, Fla.

Seasonal Changes In The Principal Varieties of Florida Oranges

This paper is based on results of an investigation made for the purpose of obtaining information on the seasonal changes, physical and chemical trends and varietal characteristics of the leading and some of the less common commercial varieties of Florida oranges (*Citrus sinensis*, Osbeck) during development and ripening on the tree.

This study shows how the character of the different varieties of oranges is related to the legal maturity standard at different times prior to and throughout the normal harvesting period for each variety.

The findings are based on a systematic study during three seasons from 1935 to 1938, involving the periodic analysis of more than 13,000 individual fruits and about 1,100 composite samples of 25 to 50 oranges each.

The varieties of oranges included in the investigation were: Parson Brown, grown on rough lemon and sour orange rootstocks, Boone's Early, Sixteen to One, Hamlin, Homossassa, Jaffa, and Pineapple oranges, grown on rough lemon rootstock; Conner's Seedless and Lue Gim Gong, on sour orange rootstocks; Seedlings; and Valencias, grown on rough lemon, sour orange, grapefruit, Cleopatra and sweet orange rootstocks in Central Florida, and Valencia oranges grown on rough lemon and sour orange rootstocks at Merritt Island, Florida East Coast.

The determinations included seasonal changes in weight and diameter of the fruit, color of rind and flesh, thickness of rind, volume of juice, flavor, ascorbic acid content, buffer capacity, ash pH, total acidity, total solids, sucrose and reducing sugars in the juice of early, midseason and late oranges.

In this paper only a few of the results for the principal varieties and for a typical season are presented. The complete report for all the varieties of oranges tested will be published as a technical bulletin of the United States Department of Agriculture.

Materials And Methods

The oranges were obtained from 9 different commercial groves in Central Florida and on Merritt Island, Florida East Coast. In these

By Paul L. Harding

Associate Horticulturist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture, at Meeting of Florida State Horticultural Society, Tampa, Fla., April 2, 1940.

groves, plots of about 25 trees were selected. Care was exercised in the choice of both groves and plots in order to avoid abnormal soil and fertilizer practices. Exceptionally young and exceptionally old trees were avoided unless the fruit from such trees was wanted for comparative purposes.

Samples were usually collected at intervals of two weeks until commercial picking of the plots. After this, only 2 or 3 trees were reserved to supply fruit for later analyses, which were made at somewhat longer intervals.

Each variety was sampled over a period of several months so that various stages of fruit development and ripening were included. The analyses were commenced while the fruit was still immature and were continued periodically, usually until senescence was reached, as indicated by the flavor of the juice and the "drying out" of the fruit. Tests on early and midseason varieties commenced each season about September 1, whereas tests on Valencia oranges were started about December 1. The time covered by one season's experiment is indicated in tables 3 to 6.

Oranges for all the tests were selected at random, care being taken to pick only fruit from the regular bloom. Each sample consisted of about 75 oranges, 25 of which were analyzed individually. The juice of the remaining fruit was extracted by hand squeezing and aliquots of this composite sample were used in the determination of ascorbic acid and for comparative taste tests. The

(Continued on page 6)

Table 1. Seasonal Changes in the Volume of Juice of Early and Midseason Oranges.

Variety	Root Stocks	Juice 100	Juice 80	Juice 90	Juice Standard Box (1 3/5 Bu.)
		gms. fruit	lbs. fruit	lbs. fruit	Size 200
Parson Brown	R.L.	50 53 48 48 4.8	5.1 4.6 4.6 5.4 5.7	5.2 5.2 5.57 5.00	
Parson Brown	S.O.	50 54 52 51 4.8	5.2 5.0 4.9 5.4 5.8	5.6 5.5 5.61 4.91	
Hamlin	R.L.	44 49 47 43 4.2	4.7 4.5 4.1 4.8 5.3	5.1 4.6 4.90 4.74	
Sixteen to 1	R.L.	49 51 45 39 4.7	4.9 4.3 3.7 5.3 5.5	4.9 4.2 5.37 4.76	
Seedlings	R.L.	49 54 54 54 4.7	5.2 5.2 5.2 5.3 5.8	5.8 5.8 5.64 5.21	
Pineapple	R.L.	46 51 50 49 4.4	4.9 4.8 4.7 5.0 5.5	5.4 5.3 5.42 4.68	
		M1	Gals.	Gals.	Gals.
			9/1-10/13	10/14-11/24	9/1-10/13
			10/14-11/24	11/25-1/5	10/14-11/24
			1/6-2/16	1/6-2/16	11/25-1/5
			9/1-10/13	1/6-2/16	1/6-2/16
			10/14-11/24	1/6-2/16	1/6-2/16
			9/1-10/13	1/6-2/16	1/6-2/16

Table 2. Seasonal Changes in the Volume of Juice of Late (Valencia) Oranges.

Variety	Root Stock	Juice 100	Juice 80	Juice 90	Juice Standard Box (1 3/5 Bu.)
		gms. fruit	lbs. fruit	lbs. fruit	Size 176
Valencia	R.L.	50 52 50 46 4.8	5.0 4.8 4.4 5.4 5.6	5.4 5.6 5.4 5.0 5.33	5.13
Valencia	S.O.	53 54 55 52 5.1	5.2 5.3 5.0 5.7 5.8	5.9 5.6 5.85 5.36	
		M1	Gals.	Gals.	Gals.
			11/8-1/3	1/4-2/28	1/4-2/28
			1/4-2/28	3/1-4/25	3/1-4/25
			3/1-4/25	4/26-6/20	4/26-6/20
			4/26-6/20	11/8-1/3	11/8-1/3
			11/8-1/3	1/4-2/28	1/4-2/28
			1/4-2/28	3/1-4/25	3/1-4/25
			3/1-4/25	4/26-6/20	4/26-6/20
			4/26-6/20	11/8-1/3	11/8-1/3

Some Plant ImmigrantsIn Florida

BY ERDMAN WEST
Mycologist, Agricultural Experiment
Station, University of Florida

We usually think of plants as something we can depend on to stay in one place. In fact, this is one of the outstanding differences between plants and animals, at least in the mind of the average citizen. Some plants, however, are among the most inveterate travellers in the world.

We are all familiar with Man's activities in moving plants from place to place. These are usually economic plants or ornamentals that are purposely transported for practical or aesthetic reasons. Such plants must be pampered to some extent or they soon disappear. Many of our cultivated plants come in this category. Occasionally a plant carried to a new region finds conditions so congenial

that it is able to reproduce and increase. Under such circumstances it takes its place with the native vegetation of the land, with which it must compete on equal terms. The china-berry is a good example of this in Florida. The tree originally came from India and was planted as an ornamental or shade tree. Now we can find individuals growing vigorously along fence rows or in our woods where birds have carried the seeds.

The castor-bean forests that border portions of Lake Okeechobee are another example. The castor bean was planted as a commercial crop in this vicinity many years ago. It is no longer grown commercially, but

stray seeds which have fallen in fertile but uncultivated ground have maintained the plant. The castor bean is a native of Africa but here in Florida we have considerable areas in which it appears to be growing wild.

Perhaps the most classic example in our State is the orange. This fruit first travelled from southern Asia to southern Europe. The Spaniards carried them on their ships across the Atlantic to Florida on some of their early exploration trips. Seeds that fell in suitable soil grew into trees and produced more fruit. Indians, animals and perhaps birds carried them far and wide into our ham-

(Continued on page 13)



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